

**NASA AMES**  
***Virtual Airspace Modeling and Simulation (VAMS)***

***Air Traffic Management System Development & Integration (ATMSDI)***



**VAMS TIM #2**

**Airspace Concepts Evaluation System:  
Data Flow**



**Douglas Sweet**

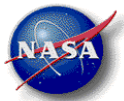
**28 August 2002**



# Outline



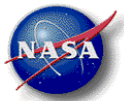
- **Build 1 Inputs**
  - User defined
  - NAS Simulation data
  - Internal simulation data
- **Build 1 Outputs**
  - Validation outputs
  - Additional outputs



# ACES Build 1 Inputs



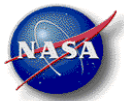
- **User defined input data**
  - **Airspace**
    - » NAS-wide
    - » Selected subset of current NAS
    - » Airports
  - **Scheduled Flight Demand**  
(ETMS-like scheduled flight plans)
    - » for each flight (airline ID, flight ID, departure airport, arrival airport, aircraft type, scheduled gate departure time, schedule gate arrival time, flight path (waypoints, cruise altitudes, speeds)
  - **Initial airport meteorological conditions** (IMC vs VMC)
  - **Winds** (historical RUC files, hourly updates)
  - **AOC cancellation and delay time limits**



# ACES Build 1 Inputs



- **User defined input data (con't)**
  - **Run-time airport capacity changes**  
(Airport ID, time, duration, change):
    - » Change due to weather
    - » Change due to reduction in available runways
    - » Changes in meteorological condition (IMC vs VMC)
    - » Changes due to introduction of new concept
  - **Run-time en route sector capacity changes**  
(Sector ID, time, duration, change)
    - » Change due to weather
    - » Change due to introduction of new concept

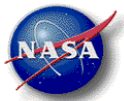


# ACES Build 1 Inputs



- **NAS data sets needed by the simulation\***
  - **Airspace Definitions**
    - » ARTCC / ARTCC sectors and boundaries
    - » Airports and locations
    - » Waypoints
  - **Capacities**
    - » Airport capacities (arrival, departure, total) for both IFR and VFR conditions
    - » En route sector capacities
  - **Aircraft Data**
    - » Represent 50 aircraft types / performance

*\* default to existing NAS specifications*

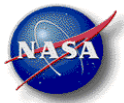


# ACES Build 1 Inputs



- **Internal Simulation Data sets\***
  - ARTCC / ARTCC sectors to grid mapping
  - Model to data set mapping
  - Agent to Federate mapping
  - Federate to computer mapping
  - Flight Data Set for each flight  
(output of Flight Demand model)

*\* used for ACES configuration and initialization*

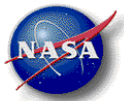


# ACES Build 1 Validation Outputs



- **Flights**

- Scheduled and actual gate departure time
- Scheduled and actual runway departure time
- Scheduled and actual flight time
- Scheduled and actual runway arrival time
- Scheduled and actual gate arrival time
- fuel utilized
- Airline
- Airline flight number
- Internal simulation flight number (unique)
- Departure Airport
- Arrival Airport
- Cancelled flight (Y/N)

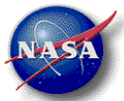


# ACES Build 1 Validation Outputs



- **ARTCC ATC (by Sector)**
  - Speed advisories issued in specified time period (15 min.)
  - Vector advisories issued in specified time period (15 min.)
  - TFM advisories in a specified time period (15 min.)
  - CD&R advisories in a specified time period (15 min.)





# Other ACES Build 1 Outputs . . .



- **TFM activities**
  - **Airport TFM advisories**
    - » Time issued, duration, action taken
  - **TRACON TFM advisories**
    - » Time issued, duration, action taken
  - **ARTCC TFM advisories**
    - » Time issued, duration, action taken
  - **ATCSCC TFM advisories**
    - » Time issued, duration, action taken
  - **AOC cancellations and delays**
    - » Time issued, AC info, delay duration



# Other ACES Build 1 Outputs . . .



- **Other possibilities:**
  - **En route CD&R activity**
    - » predicted separation before resolution
    - » actual separation after resolution
  - **TRACON flight delays**
    - » scheduled flight times
    - » actual flight times
  - **ARTCC flight delays**
    - » scheduled flight times
    - » actual flight times
  - **En Route Sector Loading**
    - » scheduled sector counts (15 minutes)
    - » actual sector counts (15 minutes)